

COASTAL SYSTEMS STATION

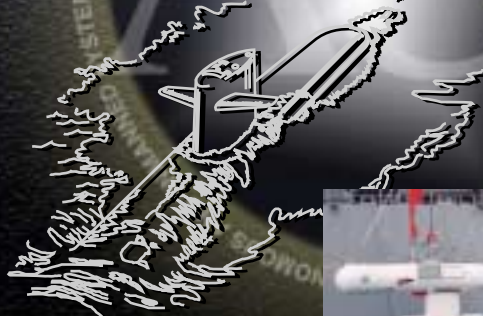
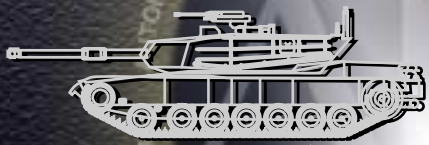
Air



Surface



Land



NAVAL SEA SYSTEMS COMMAND

# Autonomous and Unmanned Systems

Underwater



NAVAL SURFACE WARFARE CENTER  
DAHLGREN DIVISION

DAHLGREN PANAMA CITY DAM NECK



## Overview

*The future U.S. Navy will have fewer sailors, fewer ships, and smaller ships—but there will not be fewer missions, threats, or even types of threats. The transition from an offshore, blue-water Navy to one that is adapted for modern littoral combat will require new tools to handle old threats. All of these changes will demand that the Navy accomplish more with less, function well in the complex littoral warfare environment, and communicate smoothly with all participants. All future Navy platforms will host or be in receipt of the products from Autonomous & Unmanned Systems to conduct or augment their missions.*

Since the early 1970s, NSWC's Coastal Systems Station (CSS) has been developing unmanned and autonomous systems in support of submarine and submersible hydro-acoustic and propulsor research, torpedo defense, mine countermeasures, amphibious warfare, and special operations surveillance and reconnaissance. These organic and offboard unmanned vehicles, their sensors, and payloads will become a force multiplier, allowing U.S. joint and combined forces to do more with less manpower. CSS is developing unmanned systems with unprecedented emphasis on smaller, highly deployable systems, reduced total ownership cost, and maximum use of commercial off-the-shelf (COTS) technology and advanced autonomy to allow reduced operator workload. In the future, autonomous systems will be vital, allowing cooperating vehicles to communicate with each other, think for themselves, and report back to their operators occasionally with the data they have collected.

## History of Innovations

CSS has been a leader in autonomous and unmanned systems development for almost 30 years. CSS is leading today's Navy in the design, development, and testing of unmanned systems and their payloads along with their application to littoral warfare.

**Underwater Systems**—examples involving submarine hydrodynamic/acoustic research, submarine self-defense, and mine reconnaissance.



Large Scale Vehicle (LSV)



Submarine Torpedo Defense Vehicle (SMTD)



Very Shallow Water Autonomous Underwater Vehicle (VSWAUV)



Remote Undersea Mine Countermeasure (RUMIC)

**Surface Systems**—examples involving high-speed surveillance/reconnaissance, minesweeping, and mine hunting



Autonomous Search/Hydrographic Vehicle (ASH)



Remote Minehunting System (RMS)

**Airborne and Ground Systems**—Examples involving minefield reconnaissance, surveillance, and surf zone mine reconnaissance



Coastal Battlefield Reconnaissance and Analysis (COBRA)



Lemmings Crawlers

## Future of Unmanned Systems

Unmanned and autonomous systems technology is becoming a reality within the U.S. joint warfighting environment. Unmanned aerial vehicles including the Predator, Hunter, and Pioneer, have been flying in the Balkans, providing critically needed surveillance and reconnaissance data to the U.S. joint and NATO forces operating in the region.

In the conflicts of tomorrow, unmanned and autonomous maritime vehicles (UMVs) such as the Remote Minehunting System will also be deployed, allowing the U.S. joint and combined expeditionary forces to transit unimpeded through coastal areas that may be mined.

Soon, UMVs and UAVs will operate together, providing our expeditionary forces with improved ability to defend against diesel submarines, surface skimming missiles, and small high-speed gunboats, and providing the various joint and combined command echelons with enhanced battlespace awareness in the complex littoral warfare environment.

CSS is now developing sensor fusion technology and cooperative behaviors between vehicles—for example, among swarms of autonomous “swimmers” and “crawlers” in the very shallow water and surf zone for mine and obstacle reconnaissance and neutralization. As the number of unmanned systems increases, and as the number of available billets on board our ships decreases, vehicle automation becomes vital.

## Tactical Control System

TCS, developed at NSWCDD, is the control system for many of the Navy's unmanned systems. It is now being considered for all Navy and joint unmanned vehicles. TCS provides unmanned aerial and maritime vehicles with a cost-effective command, control, communications, computers, and intelligence (C4I) connectivity, and joint service interoperability, providing the warfighter in the littoral environment with unsurpassed battlespace awareness.



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